CODEWORD©

THE OFFICIAL NEWSLETTER OF THE BOARD OF BUILDING REGULATIONS & STANDARDS
~January 2004~

Thomas Gatzunis P.E.	Edward Flynn	Mitt Romney	Kevin J. Kelly	Robert Anderson
Chairman	Secretary	Governor	Acting Commissioner	Deputy Administrator

HAPPY NEW YEAR

The BBRS and DPS extend best wishes for a happy and prosperous new year. It is anticipated that 2004 will see the promulgation of the 7th edition of the One and Two Family Dwelling Code followed by the Code for all other buildings.

The BBRS would like to offer its gratitude to the individual members and member firms who generously give of their time on the advisory committees and who are working diligently on the formulation of the 7th edition.

FAREWELL COMMISSIONER LALLI

Following a period as general counsel and, for the last two years, as the Commissioner of Public Safety, Commissioner Lalli will be leaving the Department effective December 31, 2003. Commissioner Lalli has had a profound effect on the department, spearheading an office modernization and renovation and also the transitioning of the Board of Building Regulations and Standards and the Architectural Access Board into the Department of Public Safety. Commissioner Lalli will be missed by his colleagues at the Department and we wish him all success for the future.

STATE BUILDING CODE IS NOW ON LINE

The latest edition of the Massachusetts State Building Coe is now available on line. Simply go to the BBRS web page at www.state.ma.us/bbrs and follow the prompts for the building code on line.

CODEWORD IS NOW FREE OF CHARGE AND ON LINE

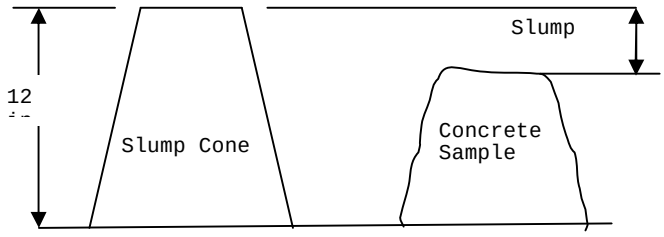
Effective this issue, *Codeword* will no longer be available by subscription. All future issues of *Codeword* will be available at no cost via the BBRS website at www.state.ma.us/bbrs

If you have a paid subscription you will still receive printed copies of *Codeword* until the subscription expires.

TESTING CONCRETE
THE SLUMP TEST
By
Brian Gore PE

A slump test is a field test conducted on a sample of fresh concrete and is a measure of the consistency of concrete. It typically does not provide information on the anticipated strength, durability, density or soundness of concrete.

Concrete consists of cement, aggregate and water (and additives if required). In order to ensure that concrete attains its desired and specified properties it is imperative that the proportion of each component of the concrete when batched is as specified. One major factor affecting the strength and durability of concrete is the Water/Cement ratio. Too little and the cement will not be fully hydrated, too much and the concrete will be left with voids as the excess water evaporates leaving voids resulting in a weaker less durable product.
Proper proportioning of mix components also ensures that the concrete is “workable”, a term used to describe the ease at which the concrete is placed and “flows” into the formwork and around reinforcement and any embedded items. Concrete must also be consistently batched in order to ensure that there are no problems in finishing (in particular for slabs). Concrete should be workable enough to ensure that it flows around



SLUMP TEST FOR WET CONCRETE

reinforcing steel, into corners of formwork and around any embedded items. A field test which is performed on fresh concrete which measures the consistency of a mix and gives an indication of the workability is the slump test. The test procedures are governed by ASTM C 143 (see 780 CMR Appendix A).

The slump test is simple and requires only a steel slump cone form; tamping rod; trowel; ruler and a stable, level, non porous base. The slump cone form is a truncated cone 12

inches high with a base diameter of 8 inches and top diameter of 4 inches. A sample of fresh concrete is recovered from the batch being evaluated and placed into the cone to 1/3 of the depth and tamped with a steel rod 25 times. A second layer is added to 2/3 the height of the cone and also tamped 25 times. The last layer is added and tamped as before and the concrete is struck off to the level of the top of the cone. The cone is then slowly pulled upward leaving the concrete sample. The slump is then measured as the difference between the height of the concrete slump cone (12 in.) and the top of the "slumped" sample in inches. The entire test is typically completed in 2 to 3 minutes.

For all construction projects this test must be performed by a *Class A Field Concrete Technician* (See 780 CMR R2 *"Concrete Testing Personnel Licensing"*). The frequency and reporting of slump tests and other field testing is required to be submitted as part of the *"Structural Tests and Inspections Program"* in accordance with Chapter 17 of the State Building Code under the direction of the project Structural Engineer.

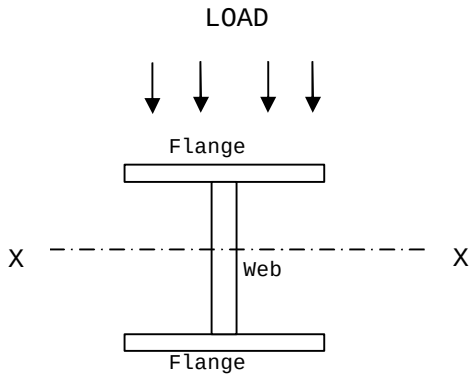
PICTURE IDENTIFICATION FOR LICENSED CONSTRUCTION SUPERVISORS

It is imperative that building officials see a picture identification and license to verify that you see a photograph of the permit applicant for EVERY building permit application in which a licensed construction supervisor is required. The BBRS is receiving many complaints from Licensed Construction Supervisors whose licenses are being used without the license holders' knowledge or consent. This will not occur if the applicant is asked to show his/her license when applying for the permit. Please be diligent in this very simple task in order to avoid improper use of these licenses.

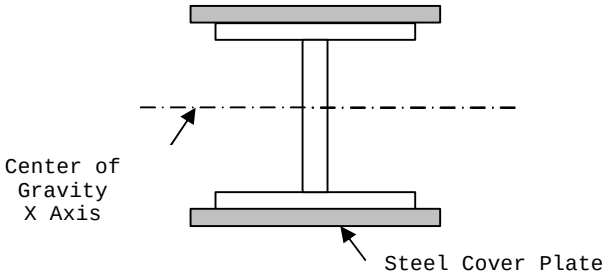
STRENGTHENING A STEEL BEAM
By
Brian Gore PE

It is sometimes necessary for steel beams to be strengthened in the field. For instance a change of use in an existing building may result in a live load increase such as would overstress an existing structural member. The structural engineer must then strengthen the existing beam. Consider the beam below which is bending about the X axis and would be overstressed in bending due to a proposed increase in live load supported. If the beam is a steel I beam, an example of a method in which the beam may be strengthened is shown below;

One of the physical properties important in resisting bending is the *Moment of Inertia, "I"*, also called the *Second Moment of Area.* The contribution of the flanges to the moment of inertia of an I beam is much greater than the contribution from the web. The most efficient way of increasing the moment of inertia is by adding area away from the center of gravity of the section. This is typically accomplished by welding cover plates to the flanges of the existing beam. The cover plates increase the moment of inertia thereby increasing the bending strength of the beam. In some cases it may not be possible to access the flanges as shown above and cover plates or other sections may be added to the underside of the flange. In either event, a Registered Professional Engineer or Architect must evaluate the existing beam strength and design an acceptable solution and check other issues of structural concern including connections, supports, shear and deflection.



Existing Beam



Strengthened Beam

MIXED USE GROUPS AND MIXED CONSTRUCTION TYPES
By
Brian Gore, PE

Mixed uses are often present in buildings. For example a school building with cafeteria, library and gymnasium is a mixed use building. The cafeteria gymnasium represent A-3 (Assembly) uses while the classrooms would be classified in the Educational or E use group.

The code requirements on dealing with mixed use groups are found in Chapter 3 of the State

Building Code but what about *"mixed construction types"*?

Then BBRS recently came upon a building under renovation and change in use which when originally constructed was of heavy timber, or type 4 construction. A new story was added and was constructed of wood frame exterior walls, woof interior partitions and wood truss roof.

In determining the construction type, the architect determined it to be of "Mixed Construction type", which it indeed is (types 4 and 5B) and proceeded to calculate height and area requirements based on each separate construction type for the different floors. This is an error as the code requires that the lower order construction type is used for the entire building and therefore the height and area analysis would be based on the 5B construction type and not a mix of types 4 and 5B.

The October 2003 edition of Codeword carried an article about the importance of the evaluation of an existing building as required by Section 3402. The example above is exactly the kind of issue which would have been evaluated and considered in the design, once again stressing the importance of this evaluation.

ANNOUNCING NEW STATE BUILDING INSPECTOR DISTRICTS

One of the duties of the Department of Public Safety State Building Inspectors is to provide technical assistance to municipal building inspectors. To this end the Department divides the State into "districts" each of which is staffed by a district state building inspector. The recent realignment of district boundaries is now complete and the inspectors have been assigned. Districts, assigned cities and towns and State Building Inspectors can be viewed the Department's website at www.stste.ma.us/dps or www.state.ma.us/bbrs and follow the links. District Offices are located in Boston, Westboro, Springfield and Pittsfield.

BBRS/DPS STAFF RECOGNIZED FOR WORK ON SECRETARY'S TASK FORCE ON FIRE AND BUILDING SAFETY

The Staff of the Department of Public Safety/BBRS was presented with a performance recognition award following their efforts on the recent Fire and Building Task Force convened by the Secretary of Public Safety. The task force was formed to study existing laws and regulations currently in place for nightclubs in Massachusetts following the Station Nightclub Fire in West Warwick Rhode Island. The awards were presented by State Fire Marshal Coan at a ceremony at the Fire Academy on November 26, 2003.

Additionally individual performance recognition awards were awarded to;

- Steven Osgood, Esq. General Counsel DPS/BBRS
- Robert Anderson Deputy Administrator BBRS
- Brian Gore PE Technical Director BBRS

A complete report of the Task Force can be found on the BBRS Web site at www.state.ma.us/bbrs/taskforcereport and a summary of the recommendations are contained in the article in this issue of *"Codeword"*

SECRETARY'S TASK FORCE ON FIRE AND BUILDING SAFETY

Following the Station Nightclub fire in February of 2003 Governor Romney requested that the Executive Office of Public Safety review the regulations in place in Massachusetts and to recommend any changes in these regulations which would enhance safety in nightclubs.

The Station nightclub fire on February 20, 2003, in West Warwick, Rhode Island, was a horrific disaster. With 100 dead and almost 200 injured, it was the fourth deadliest nightclub fire in U.S. history. But the real tragedy is that the loss of life may have been prevented with enhanced code enforcement, training of nightclub staff, and the installation of automatic sprinklers.

The blaze itself erupted when an indoor pyrotechnic display, used as a special effect in a rock band performance, ignited foam acoustical insulation surrounding the stage. At first, as the band continued to play, many patrons in the crowded nightclub thought the fire was part of the act and did not begin to exit immediately, thereby losing precious seconds for escape.

Within three minutes, the wood-frame structure was engulfed in flame and filled with smoke. More than 300 occupants struggled to flee through four exits. The Station did not have an automatic sprinkler system.

Each of these elements contributed to the tragedy:

- the proximity of pyrotechnics and foam insulation in a wood-frame building
- the crowd's initial lack of awareness of an emergency situation
- untrained staff,
- too many people with insufficient exits, and, most important
- The lack of a potentially life-saving sprinkler system.

Massachusetts Response
Formation of the Task Force

Although The Station fire occurred in Rhode Island, public safety officials were concerned that a similar event might happen in Massachusetts. Immediately, the Commonwealth's Department of Public Safety launched a task force to spot check nightclubs for code violations. The Department of Fire Services and Department of Public Safety organized training programs for fire and building officials which focused on buildings used for public assembly purposes. The Board of Fire Prevention Regulations made an emergency amendment to the State Fire Code to re-test licensed pyrotechnic permit holders. Massachusetts fire chiefs made recommendations for improving safety in public assembly buildings, and there were numerous suggestions from the general public.

On April 3, 2003, Governor Romney, directed the Secretary of Public Safety, Edward A. Flynn, to create the *Task Force on Fire & Building Safety*, and charged the group with investigating four issues:

- Expansion of the use of fire sprinklers, including the retrofitting of existing buildings;
- Review of egress requirements and occupancy limits;
- Further regulating and/or eliminating the use of pyrotechnics in entertainment venues, as well as enhancing criminal penalties for violations of these laws;
- Review of existing regulations relative to flammable decorations and interior finishes.

The Task Force was comprised of 32 individuals plus staff members representing state and local regulatory and enforcement officials, representatives of the "regulated community" including nightclubs, theatres, and restaurants, and individuals representing families of the victims of The Station nightclub fire. The task force was divided into six subcommittees concentrating on;

- •Sprinklers
- •Egress
- •Pyrotechnics
- •Interior Finishes
- •Training & Education
- •Legal

As the Task Force pursued its investigations it discovered that, on the whole, Massachusetts already possessed one of the nation's progressive sets of building and fire regulations. The state's Fire Prevention Regulations (promulgated by the Board of Fire Prevention Regulations found in 527 CMR 1.0 - 50.00) and the State Building Code (promulgated by the Board of Building Regulations and Standards, found in 780 CMR).

A synopsis of recommendations affecting the building code is shown below. A complete listing of recommendations and an unabridged report of the task force can be found on the BBRS website at

www.state.ma.us/bbrs/taskforcereport

- All existing nightclubs, discotheques, dance halls, and bars with more than a 50-person occupancy should have automatic sprinklers installed within three years

- The Board of Building Regulations and Standards should review sprinkler requirements for buildings used for other public assembly purposes, and should consider revising the State Building Code to require automatic sprinkler systems in these buildings. The Task Force recommends sprinklers be required at the following thresholds: "A-1" = 0 square feet, "A-3" = more than 5,000 square feet; "A-4" - more than 7,500 square feet.

- Require that all buildings used for public assembly purposes be equipped with a minimum 72-inch (nominal) width main exit door in addition to other required exit doors at other locations. When substantiated by an egress analysis by a registered professional, the building official may allow an alternative means of compliance, where construction, regulatory, or other conditions exist which would preclude the installation of a 72-inch door.

- All owners of buildings used for public assembly purposes should satisfactorily complete a "Fire & Building Safety Checklist" as a condition of receiving a Certificate of Inspection and liquor license.

- The Board of Building Regulations & Standards should study methods to enhance exit identification in all buildings used for public assembly purposes and incorporate these improvements in the upcoming 7th edition of the State Building Code.

- The Board of Fire Prevention Regulations and the Board of Building Regulations & Standards should study a requirement that all nightclubs, discotheques, dance halls, and bars install an automatic shutdown mechanism that disconnects the music sound system and raises house lighting in the case of fire.

- The Board of Building Regulations & Standards and the Board of Fire Prevention Regulations should immediately prohibit the use of all foam plastics on interior

finishes in all unsprinklered nightclubs, discotheques, dance halls, and bars.

? The Board of Building Regulations & Standards should review the use of foam plastics on interior finishes in buildings used for public assembly purposes, and monitor the technological development of foam plastic materials in regard to meeting flame resistance requirements. Code officials should be educated to assure that the installation of such materials is in accordance with approved testing criteria.

? The Department of Fire Services and the Department of Public Safety should develop and administer a joint training program on fire and building safety standards for both fire and building inspectors. This training program should include training for police officers in conjunction with the Municipal Police Training Council.

? The Department of Fire Services and the Department of Public Safety should develop a comprehensive training program required for operators of buildings used for public assembly that would institute the employee position of Crowd Manager in all such buildings with occupancy loads of 50 or more.

? The General Court should enact legislation creating specific criminal penalties for the owner or supervisor of buildings used for public assembly purposes public assembly building who creates a dangerous condition with regard to:

? Any blocked or significantly impeded ingress or egress;
? The failure to maintain or the shutting off of any fire protection or fire warning system required by law;
? The storage of any flammable or explosive without properly issued permits or in quantities in excess of allowable limits of any permit to store;
? The use of any firework or pyrotechnic device without a properly issued permit;
? Exceeding the occupancy limit established by the local building inspector.

? The General Court should enact legislation creating enhanced criminal penalties for an individual who violates a state building code or fire code provision that results in significant injury or death. Punishment should be a fine of not more than $25,000 and/or imprisonment of up to five years.

? The General Court should enact legislation creating statewide uniform building and fire code enforcement procedures by which building and fire inspectors can issue standardized “code citation tickets” to building owners/operators for code violations.

LOOKING BACK AT A SIMILAR DISASTER

DECEMBER 30, 1903

THE IROQUOIS THEATER FIRE, CHICAGO

by

Brian Gore PE

A grim reminder of lessons which need to be learned is highlighted by looking back 100 years to the United States worst theater fire disaster. The similarities between many of the events and scenarios in the West Warwick fire of 2003 and the Iroquois Theater fire of 1903 are strikingly similar.

The Iroquois Theater had been open for less than a month and was touted as a completely fireproof building. On December 30, 1903 a packed audience of mostly 1900 women and children were enjoying a matinee performance of the musical “Mr. Blue Beard, Jr.”. Suddenly a hot light ignited a velvet curtain and flames quickly spread to the hanging backdrops above and on the stage.

These backdrops were constructed of canvas and painted with highly flammable oil paints and in a matter of seconds were completely engulfed in flames and were raining down on the audience. Initially the band continued to play and patrons were urged to remain in their seats and not to panic causing the theatergoers to lose precious evacuation time. Unwittingly some stage hands opened an access door to the rear of the stage allowing the cold outside air into the building adding oxygen to the developing fire. A fireball erupted into the theater and incinerated people as they were seated. The proscenium “fire curtain” malfunctioned and ignited calling into question the materials from which it was made. it was supposed to be non combustible asbestos.

Inadequate fire evacuation training of staff added to the increasing panic. People rushing to the exits became trapped by doors which opened inward; passageways became jammed with people who were converging from the balcony and main level; exits which were unmarked went unnoticed; many exits were locked or blocked by metal security grills; some exit doors could not be opened as they had been equipped with handles unfamiliar to the patrons. It took only 30 minutes for the responding firefighters to extinguish the fire and only 15 minutes for 603 people to lose their lives.

The parallels between this disaster and that of the Station Nightclub almost 100 years later are clear to see. Generally, building codes are driven by both increased knowledge and also lessons learned from disasters.

Modern day codes now incorporate all of the lessons learned from events such as the Iroquois Theater disaster but modern codes alone cannot always prevent disasters. Building owners, construction professionals and code officials all play an integral part in ensuring safety in buildings. The most serious disasters appear to occur when the checks and balances built into the system fail. Unfortunately only after the investigation is fully completed will we be able to conclusively learn the lessons which need to be learned from the Station Fire.

BUILDING CODE ENFORCEMENT OFFICIAL CERTIFICATION UPDATE

Please be aware that the following reference materials will be used for building code enforcement official examinations beginning in calendar year 2004. Candidates should also check the referenced websites to ensure that they have the most up-to-date information relating to certification exam requirements.

Local Inspectors:

Exam 1A ICC *International Residential Code for one- and Two-Family Dwellings*, 2003 Edition.

Exam 1B ICC *International Building Code*, 2003 Edition.

Exam 3B ICC *International Building Code*, 2000 Edition; NFPA 13 - *Installation of Sprinkler Systems,* 1999 Edition; NFPA 72 – *National Fire Alarm Code*, 1999 Edition.

Please reference the following website for further information, candidate materials and other requirements for these examinations; Experioronline.com/ncpcci.htm.

Inspectors of Buildings\Building Commissioners

All International Codes (also called I-Codes) for the Certified Building Official Examination will be the 2003 edition.

Please refer to the International Code Council's website @ iccsafe.org/certification for more information regarding the *Technological and Legal\Management Modules* that make-up this examination; including a complete list of reference materials and where they may be purchased.

The BBRS is currently scheduling an ***Inspectors of Buildings\Building Commissioners Study Course*** for February, 2004. Certification Candidates will receive registration forms in the mail during the month of January.

Also, the BBRS is planning a continuing education course for certification maintenance during the month of March. Registration forms will be forwarded to all building code enforcement officials during the month of January, as well.

Please remember that certification is an ***individual obligation***. It is a violation of Massachusetts General Law c 143 § 3 as well as 780 CMR R7 (*Certification Regulations*) for individuals to be appointed to the position *inspector of buildings, building commissioner* or *local inspector* without first being certified unless such appointment is in accordance with requirements for conditional appointments as defined by program regulations. Conditional appointees (qualified individuals who are appointed but not yet certified) who do not achieve required certification status within the 18 month grace period are ***obligated*** to file a written request for extension. Extension requests may be addressed to:

The Board of Building Regulations and Standards
Building Official Certification Committee
P.O. Box 1063
Hadley Building
Westboro, MA 01581

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